SOAH DOCKET NO. 582-20-1895

TCEQ DOCKET NO. 2019-1156-IWD

IN THE MATTER OF THE APPLICATION OF PORT OF CORPUS CHRISTI AUTHORITY OF NUECES COUNTY FOR TPDES PERMIT NO. WQ0005253000	§ § § § §	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

PORT OF CORPUS CHRISTI AUTHORITY'S RESPONSE TO EXECUTIVE DIRECTOR'S REQUESTS FOR CLARIFICATION

On July 14, 2021, the Executive Director ("ED") of the Texas Commission on Environmental Quality ("TCEQ") filed a Request for Clarification asking the Port of Corpus Christi Authority of Nueces County, Texas ("Port Authority") to provide clarification of documents submitted by the Port Authority in response to the Commission's May 26, 2021 Order ("Order"). The following day, the ED filed its Second Request for Clarification regarding those documents. The Port Authority responds to those requests as follows:

I. RESPONSE TO FIRST REQUEST FOR CLARIFICATION

Request: 1. Please confirm the depth of the channel at the proposed location of the diffuser. According to the Memo from Lial Tischler dated June 24, 2021, ("Memo") the channel depth is approximately 90 feet at the proposed discharge location. However, in the bathymetry map included with the Memo, the depth appears to be closer to 65 feet at the revised discharge location.

Response: The depth at which the diffuser discharges is 65 feet below the surface. The location is on a steeply sloping side of the channel and the ports discharge at an angle of 30 degrees to horizontal and point across the channel toward the opposite bank. This results in the depth of the channel at which the effluent discharges into at approximately 90 feet.

Request: 2. Please confirm the x and y dimensions for the Human Health Mixing Zone ("HHMZ"). On page 5 of the Memo the HHMZ is defined as x = 145.5 m; y=321 m, however elsewhere in the Memo the HHMZ is defined as x = 321; y = 145.5.

Response: The dimensions for the Human Health Mixing Zone (HHMZ) are defined as x = 321 m; y = 145.5 m.

In addition, the Executive Director asked the Port Authority to confirm that the change in the location of the diffuser does not add any new affected landowners. The Port Authority confirms that there are no property boundaries along the shoreline within ½ mile of the new discharge location that were not within ½ mile of the old discharge location.

II. RESPONSE TO SECOND REQUEST FOR CLARIFICATION

The Second Request asks for clarification of the statement in the Tischler/Kocurek (T/K) memorandum report to Sarah Garza at the Port Authority (June 24, 2021) that: "Mixing zone definitions are not applicable to assessing the naturally occurring, inorganic chemical constituents that constitute salinity in marine water, and in this case the salinity of the desalination plant effluent." TCEQ also requests additional clarification of the near-field and far-field mixing effects predicted by the Port Authority for application to the agency's required antidegradation review.

Clarification of Statement Regarding Mixing Zone Definition for Salinity

Dr. Tischler's disclaimer in the T/K memorandum is based on the General Criteria promulgated by TCEQ at 30 Texas Administrative Code ("TAC") § 307.4(g)(3) that specifies requirements for salinity gradients in estuaries, 30 TAC § 307.3(a)(81) that defines toxicity, the water quality standards for toxic materials at 30 TAC § 307.6, and the mixing zone regulations at 30 TAC § 307.8(b) that defines mixing zones and the specific provisions of the Texas Surface Water Quality Standards ("TSWQS") to which they apply.

Salinity is identified by the TCEQ as a naturally occurring constituent of surface water to be regulated differently from other constituents, including toxic pollutants. The general criteria for salinity in estuaries [30 TAC § 307.4(g)(3)] requires TCEQ to assure that salinity gradients are maintained to support "attainable estuarine dependent aquatic life uses." Further, this rule states there are no numerical salinity criteria for estuaries thus requiring case-by-case analysis. In the

absence of numeric criteria for direct comparison at a defined mixing zone boundary, the narrative provisions of the TSWQS apply.

The *Procedures for Implementation of the Texas Surface Water Quality Standards* (RG-194, June 2010) ("IP") states that discharges of total dissolved solids ("TDS") to saltwater are to be evaluated on a case-by-case basis.[1] There is no reference to using mixing zone dimensions that are based on toxic substances regulated at 30 TAC § 307.6. This IP provision is consistent with the general criteria requirement in 30 TAC § 307.6(g)(3) that salinity gradients must support attainable estuarine dependent aquatic life uses and supports the conclusion that this evaluation should be based on analysis of the effect(s) of a new discharge on the estuarine aquatic life use, which should consider the effect on the aquatic populations using a specific water body, i.e., the Corpus Christi Ship Channel ("CCSC").

The definition of toxicity at 30 TAC § 307.3(a)(81) does not identify salinity as a toxic substance and TCEQ's numeric criteria for toxic substances at 30 TAC § 307.6 does not include salinity or any of its chemical constituents. The dimensions specified by TCEQ for aquatic life mixing zones including the ZID, the mixing zone, and the human health-based mixing zone are all based on exposure times related to toxic constituents and do not consider salinity as a toxicant.

As described at 30 TAC § 307.8(b)(10), TCEQ may specify different mixing zone sizes for specific numeric criteria to protect designated uses. Although there are no numeric criteria for salinity, this provision, for example, allows TCEQ to change the dimensions of the ZID that is identified in 30 TAC § 307.8(b)(2)(c), which is applicable to toxic substances, on a case-by-case basis. This discretion should also be available for non-toxic constituents.

[1] *See* IP p. 174.

An example in the TSWQS that is relevant to establishing mixing allowances for salinity is the industrial cooling water area provision at 30 TAC § 307.3(a)(33) that implements the temperature requirements at 30 TAC § 307.4(f). This provision does not provide specific dimensions for an industrial cooling water area but instead allows TCEQ staff to determine the dimensions of the area based on the area required to meet the temperature requirements at 30 TAC § 307.4(f). The temperature requirements at 30 TAC § 307.4(f) include a rise above ambient criterion for water temperature that is analogous to establishment of a rise above ambient salinity concentration that is protective of the marine environment.

Regulating high-salinity effluents using total toxicity provisions at 30 TAC § 307.6(e) meets the intent of the general criteria for salinity in estuaries that requires TCEQ to assure that salinity gradients are maintained to support "attainable estuarine dependent aquatic life uses."[2] The U.S. Environmental Protection Agency ("EPA") standard whole effluent toxicity ("WET") tests for marine species that are approved at 40 CFR § 136.3 Table IA can be used in the TPDES permit to provide a high level of assurance that sensitive marine species are protected. The Port Authority proposes that TCEQ add the following provisions in the TPDES permit for the Harbor Island Desalination Plant:

- Effluent samples will be tested using the EPA 7-day chronic WET test for *Mysidopsis bahia* and *Menidia beryllina,* as specified in the TPDES permit.
- The critical dilution in the WET test should be 10% effluent or less. The CORMIX modeling for the effluent diffuser demonstrates that this effluent concentration occurs under all conditions at a distance no greater than 60 meters (~200 feet) from the diffuser ports.

[2] 30 TEX. ADMIN CODE § 307.4(g)(3).

- The effluent must not exhibit any statistically significant adverse effects on the test species, as defined by the inhibition concentration to 25% of the test animals (IC_{25}) at the critical dilution of 10% effluent.
- The laboratory will report survival of the test animals at the 24-hour and 48-hour periods during the 7-day test. Reporting survival at the 24-hour and 48-hour intervals addresses the potential of acute toxicity caused by toxic substances regulated at 30 TAC 307.6 Table 1.
- There will be a minimum of five dilutions tested, including the critical dilution.
- Effluent samples will be analyzed quarterly for the term of the permit. When the permit is renewed, the Port Authority may request a reduced sampling frequency if supported by the WET data.

The proposed WET test conditions assure that the salinity in the desalination plant effluent will not cause or contribute to salinity gradients that affect attainable estuarine dependent aquatic life uses in the Corpus Christi Ship Channel. This approach is also highly protective for control of potential toxic pollutants because it applies the sublethal WET test endpoint to a percent effluent that is greater than TCEQ's default aquatic life mixing zone of 8% for estuarine and marine waters.[3]

Adding the chronic WET test as a permit condition to the existing 48-hour acute test assures protection against both acute and chronic toxicity to marine species. These WET tests are protective and accordingly the 100% 24-hour acute WET test is unnecessary in the revised permit. The technical/scientific reasons why the 100% effluent test is no longer necessary in the permit are:

- The 24-hour, 100% effluent WET test at 30 TAC § 307.6(e)(2)(b) is included in the Texas Surface Water Quality Standards to protect aquatic life in the zone of initial dilution ("ZID") for situations in which there is not rapid mixing of the effluent and receiving water.
- It is physically impossible for aquatic life to be exposed to 100% effluent discharged through a high-rate diffuser because this concentration only occurs in the diffuser port

[3] IP, p. 74.

before the effluent is released to the receiving water. For example, as shown in the CORMIX output file pcca_new_es50_5_95(1.0) in the Appendix to the T/K report, the 100% effluent occurs at the port exit. However, by the model's first time step 1.52 seconds after exit from the ports, the centerline plume concentration is 42.2% effluent. By approximately sixty-five seconds after the discharge leaves the port, the centerline concentration is down to 10% effluent. Thus, not only is exposure to 100% effluent concentration for even a second a physical impossibility, an exposure time of 24 hours is meaningless in the context of the actual physical environment of the receiving water with the use of the multiport diffuser in this case.

- In addition, salinity is the primary concern with the desalination facility discharge and the 24-hour acute test would not be applicable to measure the impact of salinity. 30 TAC § 307.6(e)(2)(B) states:

> In addition to the other requirements of this section, the effluent of discharges to water in the state must not be acutely toxic to sensitive species of aquatic life, as demonstrated by effluent toxicity tests. Toxicity testing for this purpose is conducted on samples of 100% effluent, and the criterion for acute toxicity is mortality of 50% or more of the test organisms after 24 hours of exposure. **This provision does not apply to mortality that is a result of an excess, deficiency, or imbalance of dissolved inorganic salts (such as sodium, calcium, potassium, chloride, or carbonate) that are in the effluent and are not listed in Table 1 of subsection (c)(1) of this section or that are in source waters.**[4]

Because the desalination plant effluent is concentrated seawater, whose inorganic chemical composition is greater than 99% of the cited dissolved inorganic salts, the 100% effluent WET test is inapplicable to determine the impact of salinity in the effluent to the receiving water.

Consistency with Antidegradation Policy

The discharge from the proposed desalination facility is consistent with the TCEQ's antidegradation policy because the existing uses and water quality sufficient to protect those

[4] 30 TEX. ADMIN. CODE § 307.6(e)(2)(B) (emphasis added).

existing uses will be maintained. As shown by the information provided, the proposed discharge will not result in degradation of the water quality as defined in 30 TAC § 307.5(b).

Near-Field Effects

With the revised TPDES permit application, the Port Authority has submitted to TCEQ with the revised TPDES permit application the results of 7-day chronic WET tests using the EPA methods approved at 40 CFR § 136.3 (Table IA) for one invertebrate and two vertebrate marine species.[5] TCEQ uses these chronic WET tests as TPDES permit requirements to ensure protection of aquatic life from total toxicity that may be caused by chemicals including those that do not have specific numeric criteria in the TSWQS. These tests measure both survival (acute) and growth (chronic) of the test species and are used to assess both acute and chronic toxicity. The biomonitoring laboratory measured survival at 24 hours, 48 hours, and survival and growth at 168 hours (7-days) for the salinity tests performed at the Port Authority's request.

The maximum salinity concentration evaluated in the WET tests for the invertebrate and vertebrate species was 45 parts per thousand (ppt). No observed effects on survival or growth of either test species occurred at the 45 ppt concentration at any of the time intervals evaluated. The 45 ppt concentration at the effluent plume centerline, for the most critical condition that was modeled with CORMIX in the T/K memorandum report (50% recovery, 5th percentile ambient temperature, 95th percentile ambient salinity, 1.2 meters/second ambient current), occurs at a 15.8 percent effluent concentration. This dilution is achieved inside the ZID at only 23.1 meters (m) from the diffuser ports and 19.8 seconds after the effluent is discharged from the ports.

The CORMIX modeling of the proposed diffuser provided in the T/K report demonstrates that the effluent is diluted rapidly in the CCSC across the range of ambient velocities. Salinity

[5] Invertebrate – *Mysidopsis bahia*; vertebrate – *Menidia beryllina* and *Cyprinidon variegatus*.

concentrations at the boundary of the near field region (NFR) of the effluent plume as defined in the CORMIX model[6] (where the effluent mixing is generated by momentum and buoyancy of the discharge), are below 45 ppt for all effluent/ambient conditions modeled. These model predictions demonstrate that there will be no acute or chronic effects on any of the standard WET test species in the model near field region. The maximum dimensions of the effluent plume in the NFR predicted by CORMIX for the proposed diffuser design are a small fraction of the cross-sectional area of the CCSC. TCEQ policy is to assure that there is an adequate zone of passage for aquatic life outside of the mixing zone of an effluent plume.

For example, at the previously cited CORMIX model run (50% recovery, 5th percentile ambient temperature, 95th percentile ambient salinity, 1.2 meters/second ambient current) within the NFR, which ends 152 m from the diffuser ports, the maximum cross-sectional area of the plume is 243.4 m^2. The maximum cross-section is found at 80.56 m from the diffuser ports and the centerline effluent concentration is 9.12%, which is 2.57 ppt above the ambient salinity. The cross-sectional area[7] of the CCSC at this location is approximately 5574 m^2. Thus, the plume occupies approximately 4.4% of the CCSC cross-section providing a zone of passage where there is no measurable salinity increase above ambient of 95.6% of the cross-section.

At the same effluent and ambient densities and a current of near slack tide (0.05 m/s), the maximum cross-sectional area of the plume in the NFR, at 15 m from the ports on the y axis, is 412.1 m^2 and has a centerline concentration of 4.3% effluent, which is 1.2 ppt above ambient salinity. Thus, the plume occupies only 7.4% of the total cross-section of the channel. The zone

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[6] Near-Field Region ("NFR") - a term used in the CORMIX printout for describing the zone of strong initial mixing where the so called near-field processes occur. It is the region of the receiving water where outfall design conditions are most likely to have an impact on in-stream concentrations. (Doneker, R.L. and Jirka, G.H., 2017, *CORMIX User Manual*, EPA-823-K-07-001).

[7] For the purposes of this evaluation the CCSC cross-section is estimated to be 1,200 feet (365.76 m) wide at an average depth of 50 feet (15.24 m).

of passage in the CCSC for this extreme, short-term condition is 92.6% of the total channel cross-section. These two examples demonstrate that under the full range of ambient conditions in the CCSC at the location of the diffuser, there is an unaffected zone of passage greater than 92% of the channel cross-section.

The TSWQS at 30 TAC 307.5 establish the Texas antidegradation rules that are required by the Federal Regulations at 40 CFR 131.12. The Texas antidegradation rules and the accompanying antidegradation procedures in the TCEQ IP meet the Federal requirements and are approved by EPA.

The Tier 2 antidegradation rule defines degradation as "a lowering of water quality by more than a de minimis extent, but not to the extent that an existing use is impaired."[8] The Tier 2 antidegradation rules establish a threshold of "de minimis extent" before a Tier 2 evaluation is required. TCEQ has defined, in the IP, what constitutes de minimis extent for new discharges. It states that: "New discharges that use less than 10% of the existing assimilative capacity of the water body at the edge of the mixing zone are usually not considered to constitute potential degradation as long as the aquatic ecosystem in the area is not unusually sensitive to the pollutant of concern."[9]

As previously described, there are no TCEQ mixing zone dimensions that apply to salinity. When there is a proposed new discharge of a saline effluent, TCEQ is obligated to ensure salinity gradients must support attainable estuarine dependent aquatic life uses. As a factual matter, estuarine and marine aquatic life are not unusually sensitive to salinity as is evidenced by the wide variations in salinity in estuaries including the CCSC and the Corpus Christi Bay System. In the

[8] 30 TEX. ADMIN. CODE § 307.5(b)(2).

[9] IP, p. 64.

absence of specific dimensions of a mixing zone for salinity, the de minimis evaluation can be based on the fraction of the total water flow through the CCSC that is affected by increased salinity due to the effluent discharge.

As part of its development of the design for the Harbor Island Desalination Plant, the Port Authority contracted with Jordan Furnans, Ph.D., P.E., P.G. of LRE Water, LLC to evaluate far-field effects of the effluent discharge on the Corpus Christi Bay systems (i.e., all major connected bays and channels). In addition to using the SUNTANS model to evaluate potential far-field effects in the CCSC and bay system, Dr. Furnans also calculated the total mass of the salt that the proposed discharge would release into the CCSC under the Draft Permit and compared it with the total mass of salt that flows into and out of the CCSC under normal ambient conditions at the proposed diffuser location. From that analysis, Dr. Furnans has concluded that the salt mass flux from the brine discharge from the proposed discharge is always less than 1% of the salt mass flux of the ambient waters. The proposed discharge, even at the most extreme conditions, will increase the mass of total salt at the location of the discharge by less than 1% and under most conditions, the mass of salt from the proposed discharge is much less than 1%.[10]

Dr. Furnans' calculations demonstrate that the proposed desalination facility discharge, at critical conditions in terms of the maximum predicted effluent salinity, are one-tenth or less of the 10% existing assimilative capacity for salinity in the CCSC, thus satisfying the de minimis requirement of the Tier 2 antidegradation policy.

[10] See Exhibit APP-JF-14 admitted on November 4, 2020. Dr. Furnans' salt-mass flux calculation assumed maximum effluent salinity of 78.5 ppt which is higher than the actual expected salinity at 50% recovery of 68.7 ppt. In addition, the calculation included the possibility of the 78.5 ppt effluent being discharged into an ambient receiving water at 15 ppt salinity, which is lower than the 5th percentile of salinity for the receiving water. Even with these extremely conservative inputs, the resulting contribution of the effluent to the salt flux was less than 1%.

Far-Field Effects

TCEQ procedures do not require that far-field modeling be conducted in connection with the Draft Permit. However, the Port Authority wanted further assurance that the proposed discharge would not have long-term impacts that the CORMIX modeling is not designed to investigate. In addition, an analysis of far-field impacts provides support to the Tier 2 antidegradation analysis required by 30 TAC 307.5(b)(2) by demonstrating that there are no significant long-term changes in the salinity of the waters of the entire Corpus Christi Bay system.

In 2018, the Port Authority commissioned a study of the potential long-term impacts from the proposed desalination discharge. Through a contract between the Port Authority and the University of Texas, Dr. Furnans conducted an extensive 3D modeling simulation of the Corpus Christi Bay system and the proposed discharge from the desalination facility using the SUNTANS model. After conducting the SUNTANS modeling, Dr. Furnans concluded the following:

- SUNTANS modeling results indicate that within the vicinity of the Harbor Island discharge, vertical mixing of the water column is sufficient to prevent the formation of a persistent high-salinity water layer along the channel bottom.
- Because of the hydrodynamics where the outfall is located, bottom salinity values only increase, at most between 0 and 1 ppt and do not accumulate in the CCSC and bay system.
- The Harbor Island desalination brine discharge, if properly constructed and maintained, will not likely result in environmental conditions that are potentially damaging to the Corpus Christi Bay ecosystem.
- After reviewing and validating the SUNTANS modeling, Dr. Furnans concluded that the current SUNTANS modeling is likely to under-predict mixing of the proposed desalination brine discharge.

The far-field modeling supports the conclusion that the proposed discharge will not result in significant degradation of water quality in either the CCSC or the entire Corpus Christi Bay System thus meeting the de minimis standard.

The Port Authority believes that the information provided is clearly sufficient to allow for a complete and informed antidegradation analysis, but the Port Authority welcomes any additional questions the Executive Director may have on this subject.

Respectfully submitted,

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ATTORNEYS FOR PORT OF CORPUS CHRISTI AUTHORITY OF NUECES COUNTY, TEXAS

CERTIFICATE OF SERVICE

I certify that on July 28, 2021, a true and correct copy of the foregoing was sent *via* e-mail to all parties or, if there is no email address shown, by mail.

/s/ Earnest W. Wotring
Earnest W. Wotring